Shabica & Associates, Inc.
WE BUILD BEACHES



Federal Consistency Coordinator
Illinois Coastal Management Program
Illinois Department of Natural Resources
160 N. LaSalle Street, Suite 700
Chicago, IL 60601

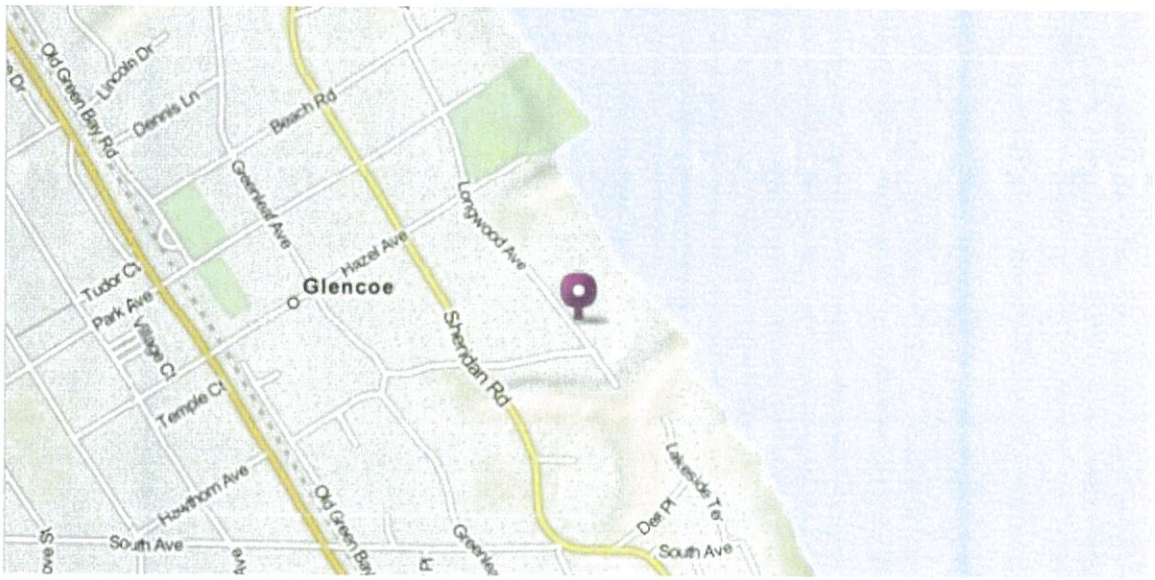
To Whom It May Concern:

July 24, 2014

In compliance with the Illinois Coastal Management Federal Consistency Review Procedures, we provide the following information for a proposed quarrystone breakwater-protected beach for the properties located at 515 and 521 Longwood Avenue, Glencoe, Illinois 60022, owned by James and Tracy Sprayregen.

**Location of Project**

The proposed quarrystone breakwater-protected beach will be built on the lakefront of the properties located at 515 and 521 Longwood Avenue, Glencoe, Illinois 60022, owned by James and Tracy Sprayregen.




550 Frontage Road • Suite 3735 • Northfield, Illinois 60093 • Tel 847.446.1436 • Fax 847.716.2007
www.shabica.com

**Project Start Date and Duration**

Work will not begin until all necessary permits have been received. It is anticipated that the project can begin by June 1, 2015. This work will require approximately 10 weeks to complete.

**Extent of Work to be Conducted**

The proposed breakwater system consists of two quarrystone and steel breakwaters built to help hold a sandy beach during fluctuating lake levels including access over the breakwaters to accommodate beach walkers. Steel steps will be installed on the south side of the steel sheetpile to provide pedestrian access over the steel. Additionally, the existing quarrystone revetment will be rebuilt to provide a final line of defense to stormwaves, as well as to provide pedestrian access to the bluff. The reworking of the revetment will provide a crest elevation of 585', and the proposed breakwater will taper gently from a landward crest elevation of 588 to 582' at the lakeward end. Mitigational sand will be placed in a quantity of 2,600 tons in the system. Additionally, multiple timber piles are exposed in the water and near the shoreline and will be removed from the lakebed during construction.

**Contact Information**

All questions pertaining to this project can be submitted to:

Jon Shabica
Shabica & Associates, Inc.
550 Frontage Road, Suite 3735
Northfield, IL 60093
jon@shabica.com
847-446-1436 Tel
847-716-2007 Fax

The proposed activity complies with Illinois' approved Coastal Management Program and will be conducted in a manner consistent with such policies.

Sincerely,

Jon Shabica
Managing Director

**Shabica & Associates, Inc.**
**We Build Beaches**

Ms. Kathy Chernich
East Section Chief, Regulatory Branch
USACE, Chicago District
111 N. Canal Street, Suite 600
Chicago, IL 60606

July 23, 2014
Rev. August 7, 2014
Rev. September 4, 2014

Dear Ms. Chernich:

Please find enclosed a permit application for shore protection for the properties located at 515 and 521 Longwood Avenue, Glencoe, Illinois 60022, owned by Strong 11 and Strong 12, LLC. Proposed work includes construction of two quarrystone and steel breakwaters, rebuilding of a quarrystone revetment, sandfill as required, and removal of old timbers and from the lakebed. Letters of authorization from the north property owners (Judy & Lawrence Zager, 529 Longwood Avenue), as well as the south property owner (Eddie Youkhana, 505 Longwood Avenue), are included with this application. In addition to sand placement on both properties, loose armorstones from the Zager's existing revetment will be replaced as necessary.

A *Design of Shoreline Erosion Protection* report has been attached to this cover letter as the coastal design specifications component of this permit. All references, photographs and figures referred to in the cover letter and the following report can be found in the Appendix.

The proposed activity complies with the approved Illinois Coastal Management Program and will be conducted in a manner consistent with such policies.

**Project Purpose Statement**
The property owners have retained Shabica & Associates (SA) to design and engineer a shore protection system for their property. This project will be constructed on the lakefront of 515 and 521 Longwood Avenue, Glencoe, where, during all lake levels, stormwaves overtop the existing concrete seawall, eroding the bluff landward (see Photo 1).

The bluff at this site has a series of deteriorating timber retaining walls beginning with a concrete seawall at the base of 521 Longwood. Over time and due to erosion, splash stone was placed east of the lowest timber retaining wall and a quarrystone revetment was placed east of the concrete seawall (see Photo 2).

The proposed breakwater system consists of two quarrystone and steel breakwaters built to help hold a stable beach during fluctuating lake levels including access over the breakwaters to accommodate beach walkers. A 90' long steel sheetpile groin will be installed with a landward crest elevation of 587.5' (IGLD 1985) tapering down to 583' at the lakeward end. The last lakeward 10' will angle to the north with a quarrystone breakwater extending northeast from the groin. This quarrystone breakwater will be 100' long toe to toe with a crest elevation ranging from 584' a the south end to 582' at the north end. This breakwater will extend to almost 125' east of the seawall. Steel steps will be installed on the south side of the steel sheetpile to provide pedestrian access over the steel. Along the north property line, a 55' long steel sheetpile groin will be installed with a landward crest elevation of 583' tapering down to 582' at the lakeward end. The last lakeward 12' will angle to the south with a quarrystone breakwater extending southeast from the groin. This quarrystone breakwater will be 36' long toe to toe with a

crest elevation of 582'. This breakwater will extend to 74' east of the seawall. Additionally, the existing quarrystone revetment will be rebuilt to provide a final line of defense to stormwaves, as well as to provide pedestrian access to the bluff. Pedestrian access to the north is via the existing concrete seawall/walkway. The reworking of the revetment will provide a crest elevation of 585'. Mitigational sand will be placed in a quantity of 2,600 tons in the system. Additionally, the existing steel ramps in the revetment and multiple timber piles that are exposed in the water will be removed from the lakebed during construction.

This section of coastline has historically lost sand due to lakebed downcutting, especially during prolonged periods of low lake levels. Nearshore sand deposits are non-existent here (Figure 1, Appendix) and scientists estimate that the rate of lakebed erosion averages 6 inches per year (Nairn, 1997). The net result is similar to the effects of global warming and rising sea level on marine coasts. This includes deeper water nearshore, larger stormwaves and progressively narrower beaches as the nearshore lakebed continues to erode. This has resulted in bluff toe erosion especially during average to high lake levels. While a narrow beach has been present at this site during higher lake levels, stormwaves have scoured the beach at the toe of the seawall and revetment. If ignored, this will lead to destabilization of the seawall and bluff face causing loss of tableland and infrastructure.

The Illinois Lake Michigan shoreline is considered "sediment starved" by coastal scientists. This is in contrast to East Coast and Gulf Coast open ocean shores where tens of thousands of tons of sand are found in the nearshore system that provide a primary line of defense against stormwaves. On most Great Lakes shores including southern Lake Michigan, natural sand beaches are not able to protect the lakeshore (exceptions may be during very low lake levels as in 1964 or 2004-07). Large quantities of sand have been trapped or diverted offshore by municipal structures that extend 900 feet or more into the lake. Today, the main sand supply is wave erosion of the nearshore glacial clay lakebed that contains only about 10% sand (Shabica and Pranschke, 1994). The result is that groins are losing their effectiveness at holding a sandy beach during average to high lake levels. To retain a sand covering of the shallow lakebed (where downcutting is most active), as well as to protect the revetment and bluff toe, SA has designed a stone headland bay beach system to hold sand as necessary to protect the lakebed and bluff during higher lake levels.

If beach and nearshore sand is lost, degradation of the nearshore ecosystem will result. Meadows et al., (2005) reports an increase in zebra mussels *Dreissena polymorpha*, and a decrease in native zooplankton in waters where the lakebed is eroding clay and rocks. In comparison, a nearshore area with 100% sand cover supports a species-rich community. The report concludes, "it [is] nonetheless clear that sand-based areas were characterized by sufficient shallow water fish CPUE and species richness to suggest that these are important habitats within the context of the Great Lakes Basin and not simply 'wet deserts' as they are often considered."

**Design Options**

The site at 515 and 521 Longwood, Glencoe has been inspected and options for shore protection were determined using desktop coastal engineering, site conditions from the 2012 bathymetric survey, and several years of observations of the deteriorating shoreline conditions at this site. Given the beach erosion over the last two years during extreme - low lake levels, as well as the uncertainty of future lake levels, it is prudent to engineer and design systems that will anticipate greater lakebed downcutting, higher amounts of beach erosion, more extreme storm events with larger waves, and potential loss of land. These five design options were considered:

*OPTION 1*

*Do Nothing –*

The first option of "Do Nothing" results in leaving the currently eroding beach in its existing state. In recent years, the beach has frequently been non-existent here with evidence of waves overtopping the revetment and seawall. Continued deflation of the beach, along with lakebed erosion, will allow stormwaves to impact and overtop the existing revetment and seawall at current levels and will cause increased erosion of the bluff during higher lake levels.

*OPTION 2*

*Enhance the Revetment Only –*

The second option considered is to merely enhance the existing revetment. This option provides protection of the bluff at the cost of the following:

1. Continued erosion of the lakebed, which will ultimately destabilize the revetment toe
2. Modification of the revetment crest, raising it to an elevation of about 5 feet higher than the current elevation to adequately protect the toe of the bluff
3. Substantial modification to the lower bluff to maintain the area's functionality (a patio and storage area where access and view of the lake would be reduced)
4. Modification of the revetment will reduce the amount of beach at this site, which is already non-existent during parts of the season

Due to the reasons listed above, this option is not recommended.

*OPTION 3*

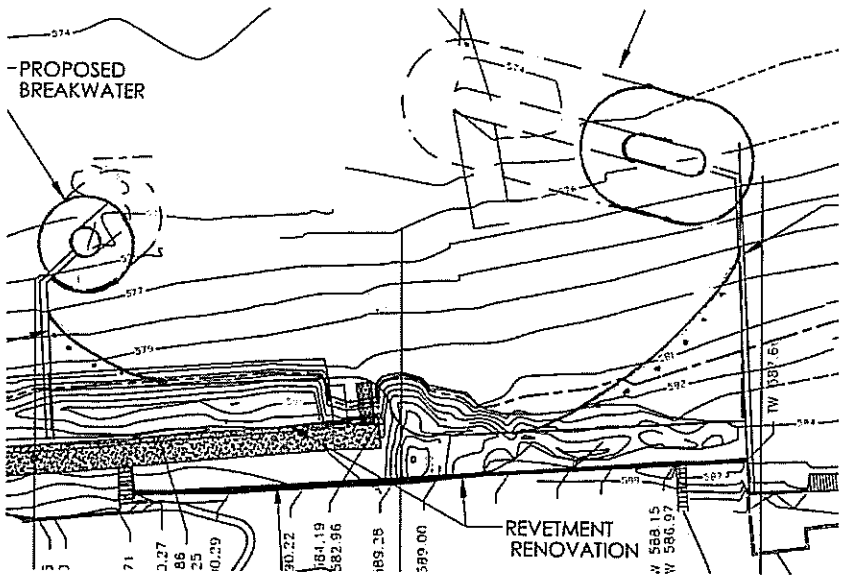
***Preferred Option: Design a Headland Bay Beach System (125' Offshore) –***

The preferred option is to protect the property with a pocket breakwater system. Based on research of prototypes along the Illinois North Shore, structures that extend less than around 125' offshore with a wide gap opening between structures do not dissipate enough wave energy to hold a stable beach with fluctuating lake levels. As this system meets the recommended 125' offshore, it will improve the level of shore protection at this property. This plan also includes a short breakwater at the north portion of the property. This short breakwater will help retain sand and reduce the gap between the breakwaters to help maintain a more stable beach cell system. The proposed plan will help protect the glacial clay lakebed, as well as the beach and bluff, while allowing safe access to Lake Michigan. This option will help stabilize the sand on the adjacent beaches by reducing wave energy in the immediate area.

*OPTION 4*

*Design a Smaller Headland Bay Beach System (Groin with Small Headland) –*

Designing a smaller pocket system was reviewed. The smaller design had a reduced breakwater length and larger gap. This plan does not hold a thick enough sand cover to alleviate lakebed downcutting. With the current lake conditions and narrow beaches during low lake levels, a smaller system would not adequately serve as shore protection.




**OPTION 4: Design a Smaller Pocket System**

OPTION 5-

*Design a Larger Beach System –*

Designing a larger system was not entertained. A larger beach system on this property is not necessary to adequately provide long-term protection from stormwaves to the property due to the nearshore water depths.

**Public Benefits of Sandy Beaches**

The Great Lakes represent the most important natural resource in the United States. Sandy beaches play an important role in keeping the lakes clean and safely accessible. Furthermore, a sandy beach makes a better ecotone (transitional environment) for flora and fauna than seawalls and revetments. Summary arguments supporting a sandy beach system include:

1) Beaches are filters for non-point source runoff.
2) Beaches reduce lakebed downcutting, a source of fine clay pollutants.
3) Beaches support endangered species such as sea rocket, marram grass, and seaside spurge.
4) Beaches make better wildlife habitat than actively eroding bluffs or seawalls.
5) Stone headlands make better fish habitat than eroding lakebed clay.
6) Beaches protect the lakebed from erosion that causes larger stormwaves to impact the shore.
7) Beaches are far safer for swimmers and boaters than a coast lined with seawalls or revetments, especially in an emergency.
8) Beaches, unlike most steel or concrete seawalls, are not visual pollution.

**Impacts to Downdrift Properties**

Immediately downdrift of this property is a property protected by a groin held beach. The proposed shore protection system will help to hold sand (mitigational sand placed as part of this project) immediately downdrift by reducing the width of the beach cell and reducing wave energy with the placement of armorstones at the lakeward extent of the structures.

**Impact to Littoral Drift System**

The proposed plan for this site includes construction of two quarrystone and steel breakwaters, rebuilding the existing revetment, and placement of sandfill as required for permit.

The existing section of Lake Michigan shoreline at 515 and 521 Longwood, Glencoe is fully engineered for more than 1,000 feet to the north and south with steel groins, piers and seawalls, as well as quarrystone revetments and headlands. About 1,200 feet north of the project site, the Park Avenue beach pier extends about 300 feet east of the bluff. The nearest structure extending onto the bed of Lake Michigan is about 150 feet to the south. It is a steel groin that projects about 125 feet lakeward from the bluff toe. Based on our experience, as the proposed structure will not extend beyond 125 feet offshore and will be filled with mitigational sand, it will not negatively impact the littoral system after the sandfill is placed (anticipated quantity plus 20% overfill). According to the Illinois State Coastal Geologist (Chrzastowski, 2005), "the design to contain placed sand is becoming necessary because of reduced volume of littoral sand in transport." He further states, "beach-cell systems may represent the future for beaches along much of the Illinois bluff coast from Waukegan south to Evanston."

The beach system will be nourished with sand including a 20% overfill placed north and south of the system. The new IDNR regulations for structures that will retain sand require pre- and post-construction surveys, as well as surveys at the one- and five-year intervals. This new requirement will help assure that a sand equilibrium is met and that the new project is gaining and losing sand at a similar rate to neighboring properties.

**Impact on Public Uses**
Public access will be maintained as pedestrians will be able to cross the steel sheet pile by climbing a set of steel stairs connected to the sheetpile, then walk across the new beach. The local beach walkers will continue to walk the concrete seawall path that is about 6 feet wide (see Photo 2). This is the current method of traversing the coastline due to lack of exposed sandy beaches in this area and it will continue to allow pedestrian access across the beach. The beach will provide a safe place for boaters and swimmers in distress. Fishing will not be impacted negatively, as the underwater area of the quarrystone protection will create an improved fish habitat. Additionally, navigation of water craft will not be impacted, as the proposed construction will not extend further east than the existing structure.

**Impact on Natural Resources**
Quarrystone structures in the nearshore waters of Lake Michigan and sandy beaches improve native species habitat. The LandOwner Resource Centre with support from the Canadian Wildlife Service and the Ontario Ministry of Natural Resources states that, "unstable shorelines can release silt that can choke nearby aquatic habitats." Additionally, underwater structures such as artificial reefs constructed of large boulders and clean riprap material "in large water bodies, such as the Great Lakes . . . are often the best method of creating habitat." As stated above, according to Meadows, et al., 2005, "a nearshore area with 100% sand cover support[s] a species rich community." As the design does not impact the bluff and vegetation, the local terrestrial wildlife will continue to inhabit this property.

**Type of Permit**
The scope of this project requires an individual permit.

**Description and Schedule of Proposed Activity**
All of the proposed work will be completed using a marine-based crane to deliver clean stone and possibly clean sand, while a backhoe will work on land to place the materials. If possible, sand will be delivered by land to the beach. Work will not begin until all necessary permits have been received. This work will require approximately 12 weeks to complete.

**Type and Quantity of Fill/Measures Taken to Avoid Impact/Erosion and Sediment Control Plan**
All material will be clean and from inland quarries. Approximately 1,260 tons of new, clean quarried stone will be placed to construct the revetment and breakwater. Approximately 2,600 tons of clean sand will be placed on the existing beach. Acreage of stone placed on the lakebed east of the OHWM is less than 0.1 acres.

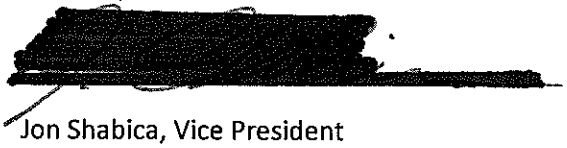
The marine contractor will sound the lakebed prior to mobilizing for this project. If the water is too shallow, more trips will be made with smaller barges that draft less in order to avoid or reduce the quantity of sand to be relocated for access to the project site. Care will be taken to impact the lakebed as minimally as possible.

Clay removed from the lakebed for placement of toe stone will be removed using a backhoe and then placed on the barge and removed from the site. The timbers to be removed from the lakebed lakeward of the 515 property will be pulled from the lakebed using a backhoe and then removed from the site via barge and disposed of properly offsite.

**Summary**
All of the above described activities and plans will follow IPP terms and conditions. All of the proposed work adheres to the guidelines prescribed by the Illinois Environmental Protection Agency and its Anti-Degradation Assessment. U.S. Fish & Wildlife Service and the Illinois Historic Preservation Association will be updated on all relevant correspondence.

If you have any questions, please feel free to call me at the phone number below.

Sincerely,



Jon Shabica, Vice President

CC: IDNR (Casey)
IEPA (Heacock)
U.S. Fish & Wildlife Service
Illinois Historic Preservation Agency (Haaker)
James & Tracy Sprayregen

## COASTAL DESIGN SPECIFICATIONS

## DESIGN OF SHORELINE EROSION PROTECTION

### Introduction

The following report summarizes assumptions and design criteria for two quarrystone and steel breakwaters, a quarrystone revetment and sandfill mitigation to help provide access, reduce erosion and protect the property located at 515 and 521 Longwood, Glencoe. The design is based on the drawings included in the permit application to the U.S. Army Corps of Engineers dated July 9, 2014.

The site lies within a fully engineered section of urban lakeshore that is typically protected with revetments, seawalls, impermeable piers and steel sheetpile groins that may hold narrow beaches. There are no naturally eroding bluffs in the area.

This section of coast is sand-starved due to municipal structures (littoral barriers) constructed over the past 100 years that extend lakeward beyond the littoral zone and reduce sand bypass. Although there is currently an exposed sandy beach due to extreme low lake levels, the beach width varies greatly due to the vulnerability of this location. According to the Illinois State Geological Survey, there is almost no sand moving along this section of coast. All structures in the area have been steadily losing their effectiveness at holding beach sand. This problem is exacerbated by lakebed erosion. In many cases where all the sand has been lost, the adjacent bluffs have begun to erode. To provide adequate protection for the upland property, solutions have typically been of two types: breakwater- or groin-anchored beaches to protect the bluffs, or large quarrystone revetments placed against the toe of the bluff that prevent stormwave erosion but at the expense of the beach.

### Project Description

Construction of a quarrystone and steel breakwater, a short quarrystone breakwater, a quarrystone revetment and sandfill mitigation are proposed that fulfill the design requirements of 20-year stormwave erosion protection. The existing quartzite revetment at this site has deflated. The proposed system is designed for average to high lake level conditions.

### Summary Specifications

Using the Army Corps of Engineers Shore Protection Manual (1984), performance of nearby prototypes and other sources, the following specifications were developed for this site (elevations are based on IGLD 1985):

| **Stone Breakwater Specifications** | |
|---|---|
| Lakeward Crest Elevation: | 582 ft |
| Toe of Structure: | 574 ft (average) |
| Crest Width: | 6 ft |
| Average Armor Size: | 2.5 tons |
| "B" Stone | 200 lbs to 800 lbs |
| Slope: | 1:1.5 |
| Tons/linear ft: | 10.7 tons |

| **Assumptions** | |
|---|---|
| • Design High Water (DHW): | 582.5 ft * |
| • Design Water Level: | 580.0 ft |
| • Design Low Water (DLW): | 577.5 ft * |
| • Existing clay till elevation at breakwater toe: | 575.0 ft |
| • 20-yr lakebed erosion at toe of breakwater: | 3 ft** |
| • Design wave height: | Hs = 5.85 ft |

**Assumptions (continued)**

| | |
|---|---|
| • Nearshore Slope: | 1:70 |
| • Design Wave Period (T): | 9.9 s *** |
| • Depth at Structure Toe DHW (Ds): | 6.5' |
| • Design Deepwater Wave (Ho): | 18.0' |
| • Design Wave Length (Lo): | 501.8' |
| • Structure Porosity: | 37% |

* DHW includes 2 ft storm setup; DLW is equivalent to Low Water Datum
** 2.5 ft sand and gravel (thickness varies) plus 2 ft clay till, Nairn, 1997
*** Resio & Vincent, 1976

**Bathymetry**

Bathymetric profiling was performed in October 2012. Five transects were completed in the project area. The profiles extend up to 600 ft offshore from the revetment toe. Tolerances were 6 inches vertical. The survey was performed using a robotic electronic total station with a diver in the water and a licensed survey crew on land. Elevations were related to hourly water level data from NOAA weather buoys.

**Water Levels**

The following table summarizes water level data representing daily highest extremes measured at Calumet Harbor, Illinois, approximately 26 miles to the south of Winnetka. Note: Low water datum = 577.5 ft (IGLD 1985).

| Lake Level | LWD | IGLD 1985 |
|---|---|---|
| Record High | +5.5 | 583.0 |
| Record Low | -1.4 | 576.1 |

**Project Supporting Data**

To help facilitate project review, SA offers the following supporting data based on standard coastal engineering practices:

1. **Sediment Transport Around Structure** The structure is designed to lie within the surf zone (zone of breaking waves), therefore allowing sediment transport around the structure. The range of breaking wave heights is from 7.4 ft based on a 6-second wave with a wave length of 184 ft (using 1/25 Lo) to 18 ft based on a 9.9-second wave with a wave length of 501.8 ft (Resio and Vincent, 1976). The commonly accepted zone of sediment transport is to 18 ft (depth of closure) in this section of Lake Michigan, which is a function of the design wave parameters. Based on this data, once the structure has been filled with sand, it will continue to bypass littoral drift sand. Rod and transit survey monitoring will be conducted, as required by the IDNR, to assure that the system performs as designed.

   The IDNR requires sand fill in areas where sediment will be trapped by the new system. Sand volume quantities have been calculated as shown in the permit drawings. As required by the IDNR, a 20% overfill will be added to the calculated volume. Additionally, the new pre- and post-construction monitoring will be performed and submitted to the IDNR to verify the impacts to the system.

2. **Effect on Adjacent Shorelines** A wave diffraction diagram (Figure 3, Appendix) has been overlain on the proposed shore protection system. Using a refracted incident wave angle of 90 degrees (USACE, Shore Protection Manual), with average and design waves, there will be a decrease in wave energy on adjacent properties. The wave diffraction pattern shows that the coefficient of diffraction (K) reduces the wave energy to a distance of about ½ the wave length downdrift and does not have an impact further downdrift.

For the average 6-second wave, that distance of reduced wave energy is about 90 ft and for the design wave, the protected distance is about 250 ft. This protected area close to the structure has diminished wave energy that will in turn reduce erosion in the area.

3. **Wave Reduction in Rubble-Mound Structures** The Iribarren number (ξ), or surf similarity number, is used to determine the wave reflection coefficient. For rubble-mound structures, wave reflection (and wave energy) is reduced by one half or more (0.2 to 0.53) (Figure 4, Appendix). For example, a wave reflection of 0.25 means that the wave energy is reduced by 75%. The range of wave reflection for beaches peaks at about 0.44. The range for plane slopes, however, quickly rises to 0.5 and peaks at .91. This illustrates that rubble-mound structures reduce wave energy almost as well as beaches.

**Lakebed Erosion**

Lakebed erosion, active in water depths of 10 ft or less, is a design component of this plan. This section of Glencoe lakeshore is considered sediment-starved. Sand deposits were measured near this site (Harbor Street, Glencoe) from the backshore to a depth of 6.3 m (21 ft). Sand deposits were thin to non-existent to a distance of 150 ft from shore (Shabica & Pranschke, 1994). Also, the site is underlain by highly-erodable, cohesive glacial clay-till. This condition increases the rate of irreversible lakebed erosion that causes deepening of the water and larger waves to impact the shoreline. According to Robert Nairn, approximately 200 $m^3$ of sand cover per meter of lakeshore (out to a depth of 4 m) is necessary to protect the underlying cohesive profile from lakebed erosion under most conditions. Sand and coarser sediments represent typically less than 15% of the material eroding from the lakebed and bluffs.

Using the historic rate of lakebed downcutting of 0.15 ft/yr (Nairn, 1997), an irreversible lowering of the nearshore lakebed clay of approximately 3.0 ft over a 20-year period is predicted in unprotected areas. With the stone breakwater, revetment and sandfill installed, the lakebed erosion will be reduced.

**Stone Breakwater Stability, Armorstone**

The proposed quarrystone breakwater has two layers of 1 – 4 ton armorstone built on a 1:1.5 slope (special placement). Overtopping of the structure is expected during storms and higher water levels. Design conditions include:

- Lakeward breakwater crest elevation 0.5 ft above DHW, 5.5 ft above DLW
- Depth-limited breaking waves will break on the stone breakwater and sand beach
- Depth at the toe of the structure is 7.5 ft (575.0) at design high water
- Incident wave directions: NE, E and SE
- Wave period for DHW T = 9.9 seconds
- Wave period for average conditions T = 6 seconds

Quartzite armorstone is recommended as it is highly durable and is locally available in most gradations under 5 tons. Hudson's formula was used to estimate armorstone size. As the majority of the breakwater will be built special placement with some areas of the lakeward face random placement, an armorstone of 1.2 tons is predicted for 2-layer random placement armorstone based on the design conditions.

**Project Monitoring**

As the performance of shore protection structures cannot be predicted with absolute certainty, the shore protection system for 521 Longwood, Glencoe will be inspected as required by IDNR guidelines. This includes topographic and hydrographic surveys beginning at an elevation of 581.5 ft (IGLD 1985) and progressing to 300 feet lakeward of the lakeward end of the project, within the north and south property lines. Additionally, all structures should be inspected to assure that they continue to meet design specifications.

**References**

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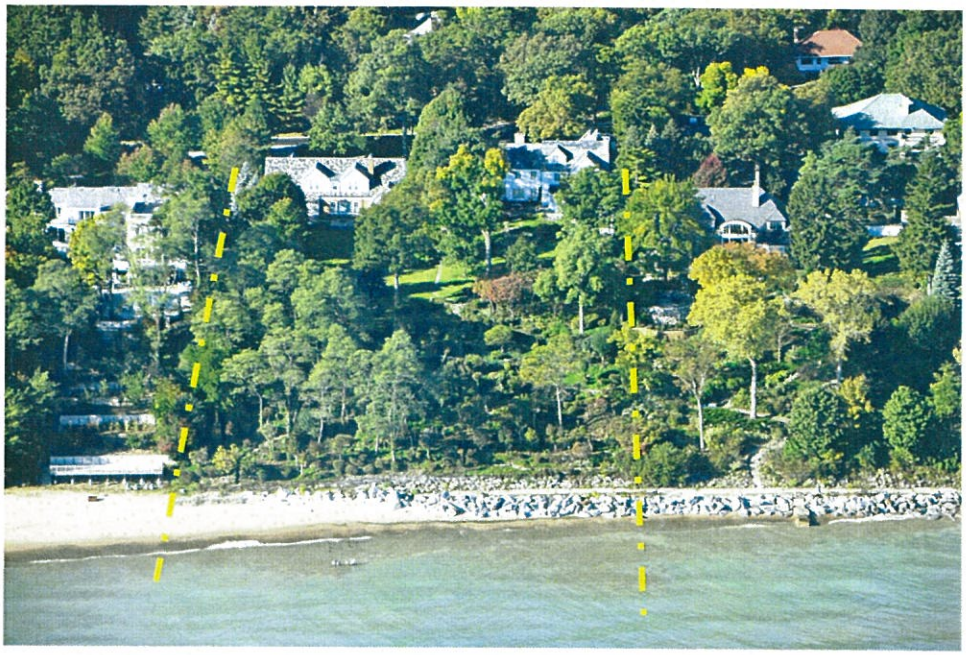
US Army Corps of Engineers, 1984, *Shore Protection Manual*, Coastal Engineering Research Center, Vicksburg, Mississippi.

**PHOTO 1**



1997 Aerial Photo (Approximate Property Lines in Yellow)

**PHOTO 2**

Photo of existing revetment looking south, concrete seawall, exposed wood pier piles (yellow arrow) and splash stone

Looking north at the revetment at 521 Longwood toward the Glencoe Public Beach (yellow arrow)

# FIGURE 1

1991 GlnHbrSt.WK1
325.7 cuyd/FT

LAKEFRONT SURVEY 1991 FIELD WORK SHEET DATE: 08 / 29 / 91

TRANSECT DESIGNATION HARBOR STREET - GLENCOE NUMBER 17

DESCRIPTION OF OBSERVATION SITE EASEMENT TO LAKE AT END OF STREET.

REFERENCE POINT BRUNTON COMPASS AZIMUTH ANGLE ____ °

SETTING-OUT HORIZONTAL DISTANCE 26 ft TRANSECT AZIMUTH ANGLE 60.0 °

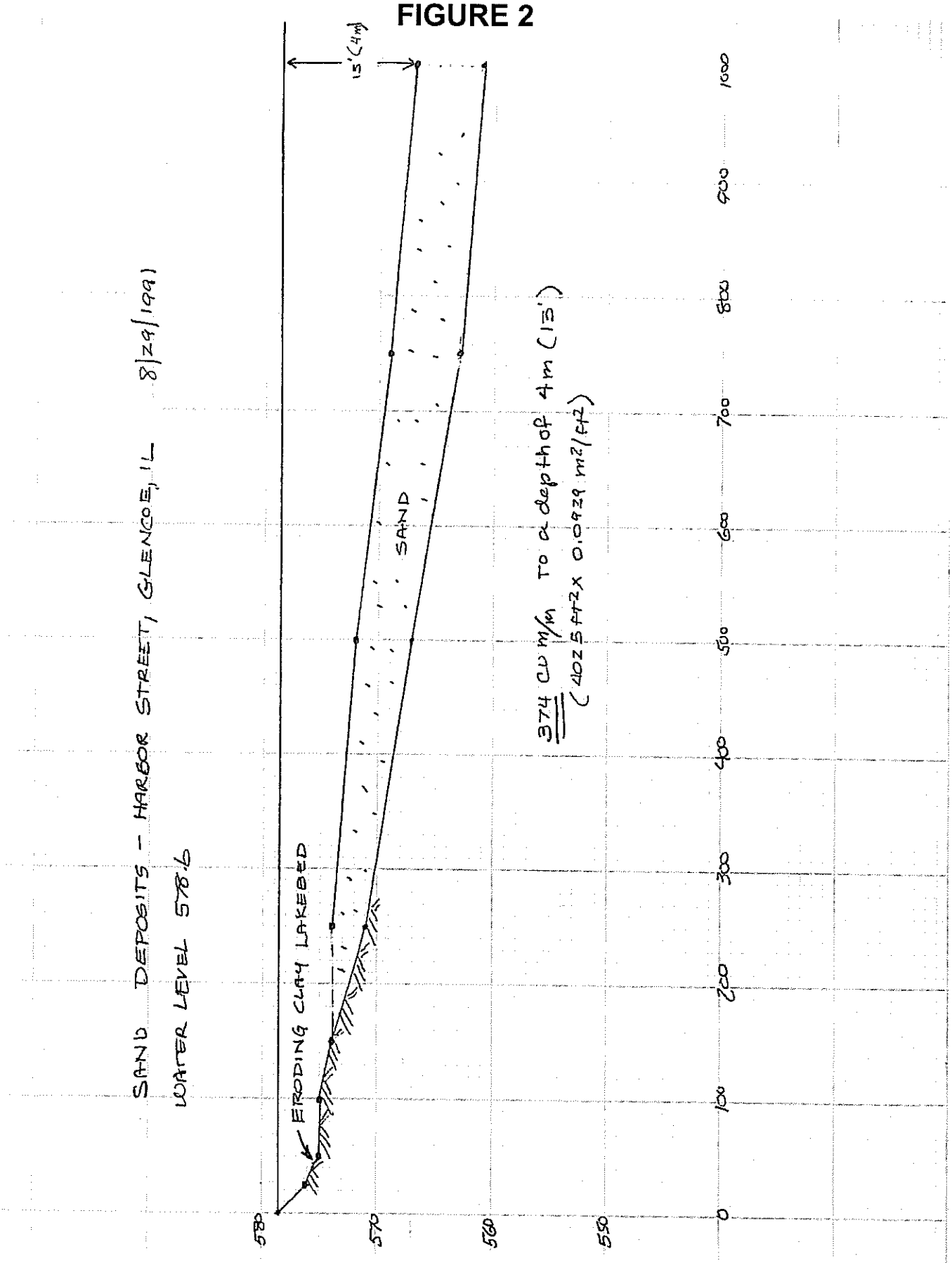
THE INTERNATIONAL GREAT LAKES DATUM MEASURED AT CALUMET HARBOR ____ ft

| POINT ON TRANSECT | NOMINAL DISTANCE | ACTUAL DISTANCE | WATER DEPTH | SAND DEPTH | SPECIAL NOTES & COMMENTS |
|---|---|---|---|---|---|
| 01 | BEACH | -25 ft | - ft | - ft | |
| 02 | SHORE | 0 ft | 0 ft | 0 ft | BULKHEAD |
| 03 | 25 ft | 25 ft | 4 ft | 0 ft | |
| 04 | 50 ft | 50 ft | 5 ft | 0 ft | MAN-MADE AREA - EXCAVATED CLAY BOTTOM IN FRONT OF BULKHEAD |
| 05 | 100 ft | 100 ft | 5 ft | 0 ft | |
| 06 | 150 ft | 150 ft | 6 ft | 0 ft | |
| 07 | 250 ft | 253 ft | 6 ft | 3 ft | |
| 08 | 500 ft | 501 ft | 8 ft | 5 ft | |
| 09 | 750 ft | 744 ft | 11 ft | 6 ft | |
| 10 | 1000 ft | 1000 ft | 13 ft | 6 ft | |
| 11 | 1250 ft | 1249 ft | 14 ft | 7 ft | |
| 12 | 1500 ft | 1497 ft | 16 ft | 5 ft | |
| 13 | 1750 ft | 1760 ft | 18 ft | 4 ft | |
| 14 | 2000 ft | 2003 ft | 21 ft | 0 ft | ROCKS AND CLAY |
| 15 | 2500 ft | ____ ft | ____ ft | ____ ft | |
| 16 | 3000 ft | ____ ft | ____ ft | ____ ft | |

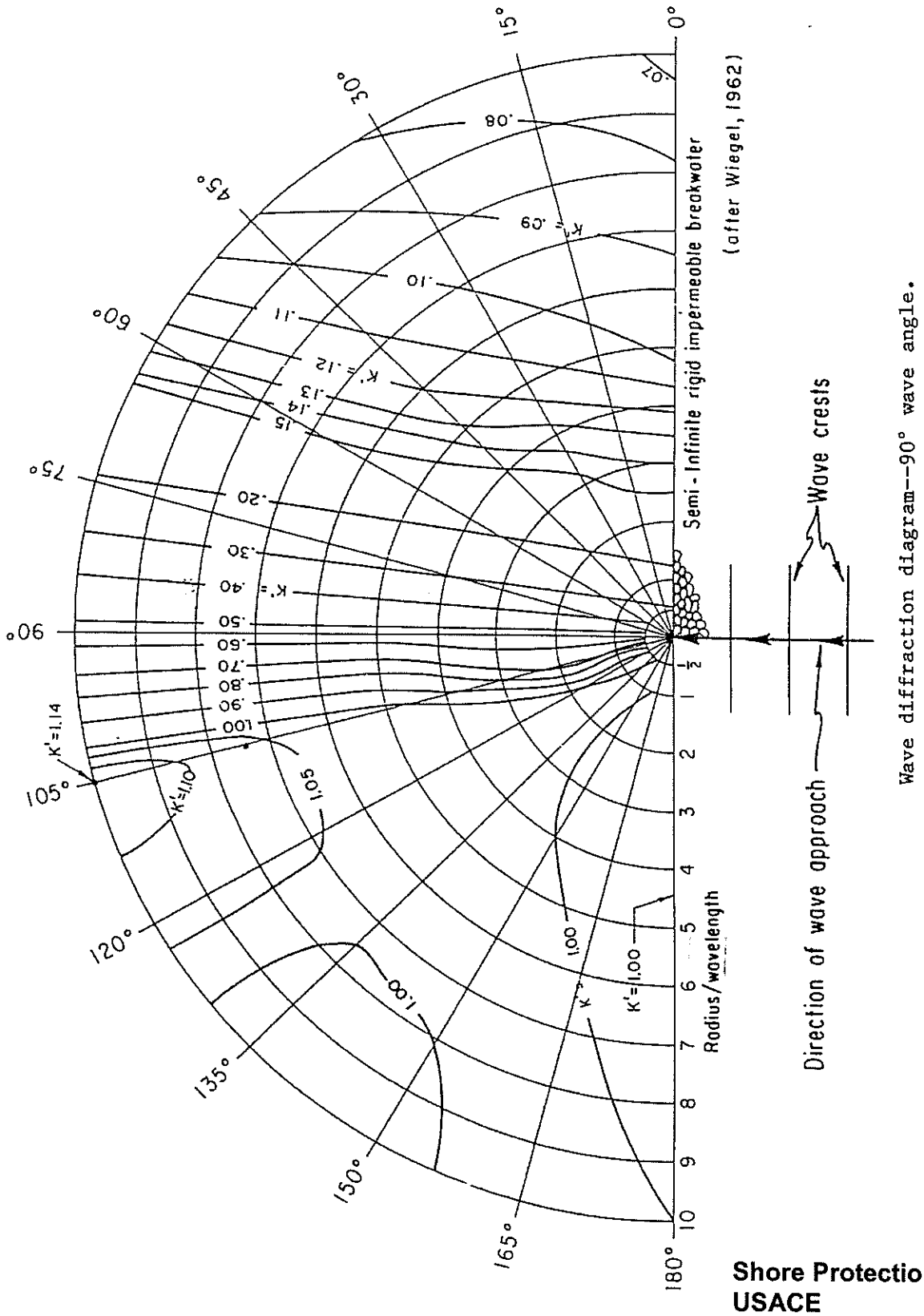
NOTES & COMMENTS : ____

Field Worksheet from 1991 USGS Lakefront Sand Thickness Survey at Harbor Street in Glencoe, note: exposed clay lakebed from shore to 150 feet east, then exposed clay lakebed again at 2000 feet east (From Shabica et al., 1991)

# FIGURE 2

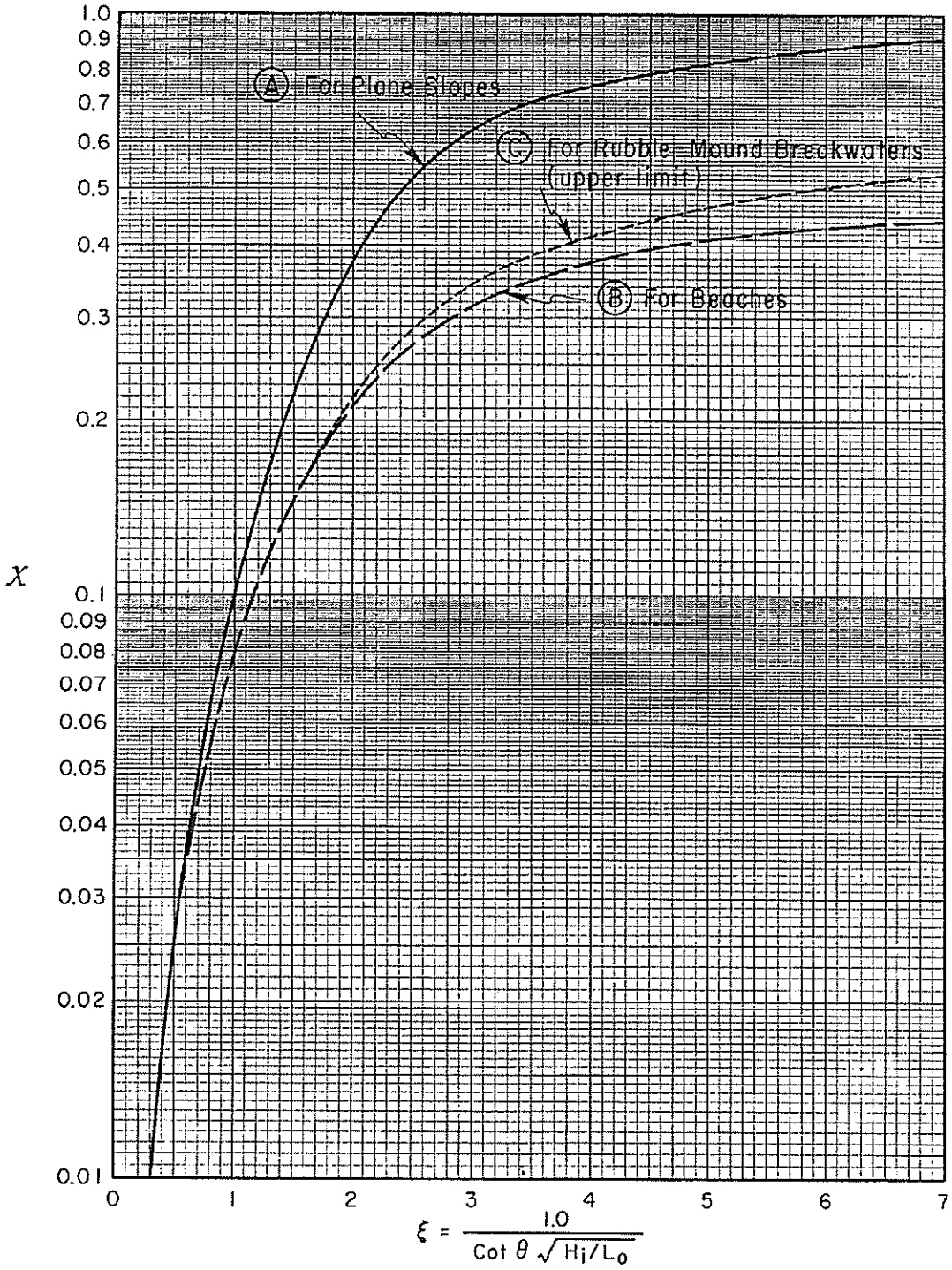

SAND DEPOSITS - HARBOR STREET, GLENCOE, IL 8/29/1991
WATER LEVEL 578.6
ERODING CLAY LAKEBED
SAND
15' (4m)
374 cu m/m To a depth of 4m (13')
(40 x 5 ft2 x 0.0929 m2/ft2)
580
570
560
550
0
100
200
300
400
500
600
700
800
900
1000

# FIGURE 3




**Shore Protection Manual**
**USACE**

# FIGURE 4




Wave reflection coefficients for slopes, beaches, and rubble-mound breakwaters as a function of the surf similarity parameter $\xi$ .

**Shore Protection Manual**
**USACE**

# JOINT APPLICATION FORM FOR ILLINOIS

ITEMS 1 AND 2 FOR AGENCY USE

| 1. Application Number | 2. Date Received |
|---|---|
| | |

3. and 4. (SEE SPECIAL INSTRUCTIONS) NAME, MAILING ADDRESS AND TELEPHONE NUMBERS

| 3a. Applicant's Name: | 3b. Co-Applicant/Property Owner Name (if needed or if different from applicant): | 4. Authorized Agent (an agent is not required): |
|---|---|---|
| Strong 11 LLC | Strong 12 LLC | Jon Shabica |
| Company Name (if any) : | Company Name (if any): | Company Name (if any): Shabica & Associates, Inc. |
| Address: 521 Longwood Glencoe, IL 60022 | Address: 515 Longwood Ave Glencoe, IL 60022 | Address: 550 Frontage Road Suite 3735 Northfield, IL 60093 |
| Email Address: | Email Address: | Email Address: jon@shabica.com |
| Applicant's Phone Nos. w/area code<br>Business: [redacted]<br>Residence:<br>Cell:<br>Fax: | Applicant's Phone Nos. w/area code<br>Business: [redacted]<br>Residence:<br>Cell:<br>Fax: | Agent's Phone Nos. w/area code<br>Business: 847-446-1436<br>Residence:<br>Cell:<br>Fax: 847-716-2007 |

***STATEMENT OF AUTHORIZATION***

I hereby authorize, Shabica & Associates to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

[redacted] 7-9-14

Applicant's Signature — Date

5. ADJOINING PROPERTY OWNERS (Upstream and Downstream of the water body and within Visual Reach of Project)

| Name | Mailing Address | Phone No. w/area code |
|---|---|---|
| a. see attached list | | |
| b. | | |
| c. | | |
| d. | | |

6. PROJECT TITLE:
Breakwater-Protected Beach

7. PROJECT LOCATION:
521 Longwood Avenue, Glencoe, IL 60022

| LATITUDE: 42.13419 °N<br>LONGITUDE: 87.74693 °W | UTMs<br>Northing: 4664945.19<br>Easting: 16T438270.99 | | | | |
|---|---|---|---|---|---|
| STREET, ROAD, OR OTHER DESCRIPTIVE LOCATION<br>Longwood Avenue | LEGAL DESCRIPT | QUARTER<br>NW | SECTION<br>8 | TOWNSHIP NO.<br>42N | RANGE<br>13E |
| ☒ IN OR ☐ NEAR CITY OF TOWN (check appropriate box)<br>Municipality Name<br>Glencoe | WATERWAY<br>Lake Michigan | | | RIVER MILE (if applicable) | |
| COUNTY<br>Cook | STATE<br>IL | ZIP CODE<br>60022 | | | |

Revised 2010

☐ Corps of Engineers ☐ IL Dep't of Natural Resources ☐ IL Environmental Protection Agency ☐ Applicant's Copy

8. PROJECT DESCRIPTION (Include all features):

The proposed breakwater system consists of two quarrystone and steel breakwaters built to help hold a stable beach during fluctuating lake levels including access over the breakwaters to accommodate beach walkers. A 90' long steel sheetpile groin will be installed with a landward crest elevation of 587.5' (IGLD 1985) tapering down to 583' at the lakeward end. The last lakeward 10' will angle to the north with a quarrystone breakwater extending northeast from the groin. This quarrystone breakwater will be 100' long toe to toe with a crest elevation ranging from 584' a the south end to 582' at the north end. This breakwater will extend to almost 125' east of the seawall. Steel steps will be installed on the south side of the steel sheetpile to provide pedestrian access over the steel. Along the north property line, a 55' long steel sheetpile groin will be installed with a landward crest elevation of 583' tapering down to 582' at the lakeward end. The last lakeward 12' will angle to the south with a quarrystone breakwater extending southeast from the groin. This quarrystone breakwater will be 36' long toe to toe with a crest elevation of 582'. This breakwater will extend to 74' east of the seawall. Additionally, the existing quarrystone revetment will be rebuilt to provide a final line of defense to stormwaves, as well as to provide pedestrian access to the bluff. Pedestrian access to the north is via the existing concrete seawall/walkway. The reworking of the revetment will provide a crest elevation of 585'. Mitigational sand will be placed in a quantity of 2,600 tons in the system. Additionally, the existing steel ramps in the revetment and multiple timber piles that are exposed in the water will be removed from the lakebed during construction.

9. PURPOSE AND NEED OF PROJECT:

To stabilize the site as well as reduce deepening of the lakebed caused by lakebed erosion.

**COMPLETE THE FOLLOWING FOUR BLOCKS IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED**

10. REASON(S) FOR DISCHARGE:

Shore protection in the form of a breakwater-protected beach

11. TYPE(S) OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS FOR WATERWAYS:

TYPE: Stone & Sand

AMOUNT IN CUBIC YARDS:

Sand: 2,068 cu.yds. Stone: 700 cu.yds.

12. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED (See Instructions)

0.0997 acres

13. DESCRIPTION OF AVOIDANCE, MINIMIZATION AND COMPENSATION (See instructions)

Utilize steel in place of stone, where appropriate, to minimize the footprint of structures on the lakebed. Rebuild the existing revetment to reduce footprint of stone on lakebed.

14. Date activity is proposed to commence: March 15, 2015 — Date activity is expected to be completed: May 31, 2015

15. Is any portion of the activity for which authorization is sought now complete? Yes [ ] No [X] NOTE: If answer is "YES" give reasons in the Project Description and Remarks section. Indicate the existing work on drawings.
Month and Year the activity was completed

16. List all approvals or certification and denials received from other Federal, interstate, state, or local agencies for structures, construction, discharges or other activities described in this application.

| Issuing Agency | Type of Approval | Identification No. | Date of Application | Date of Approval | Date of Denial |
|---|---|---|---|---|---|
| | | | | | |

17. CONSENT TO ENTER PROPERTY LISTED IN PART 7 ABOVE IS HEREBY GRANTED. Yes [X] No

18. APPLICATION VERIFICATION (SEE SPECIAL INSTRUCTIONS)

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

[redacted] — 9/3/2014

Signature of Applicant or Authorized Agent — Date

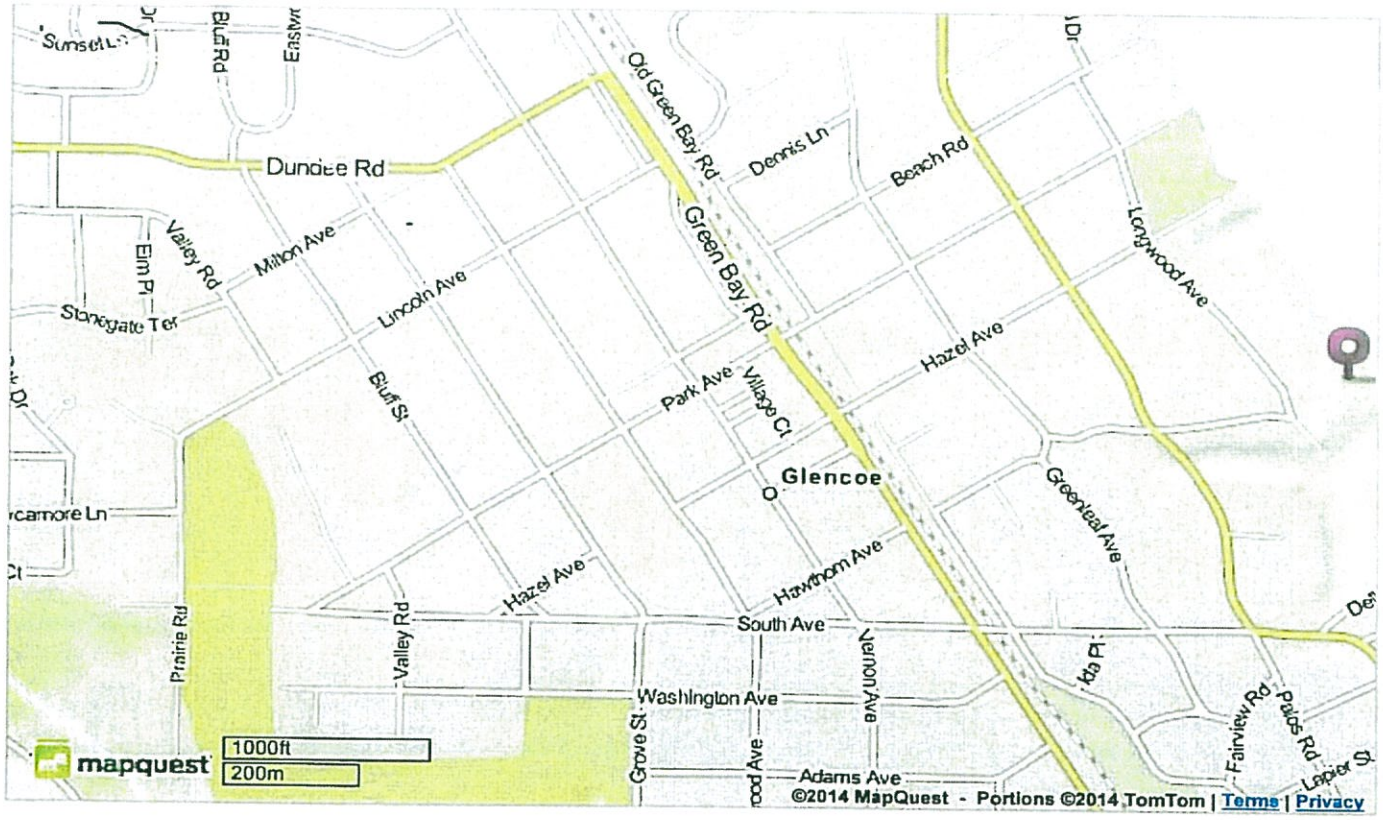
Signature of Applicant or Authorized Agent — Date

Signature of Applicant or Authorized Agent — Date

[ ] Corps of Engineers Revised 2010 [ ] IL Dep't of Natural Resources [ ] IL Environmental Protection Agency [ ] Applicant's Copy

SEE INSTRUCTIONS FOR ADDRESS

**Vicinity Map**




Breakwater-Protected Beach

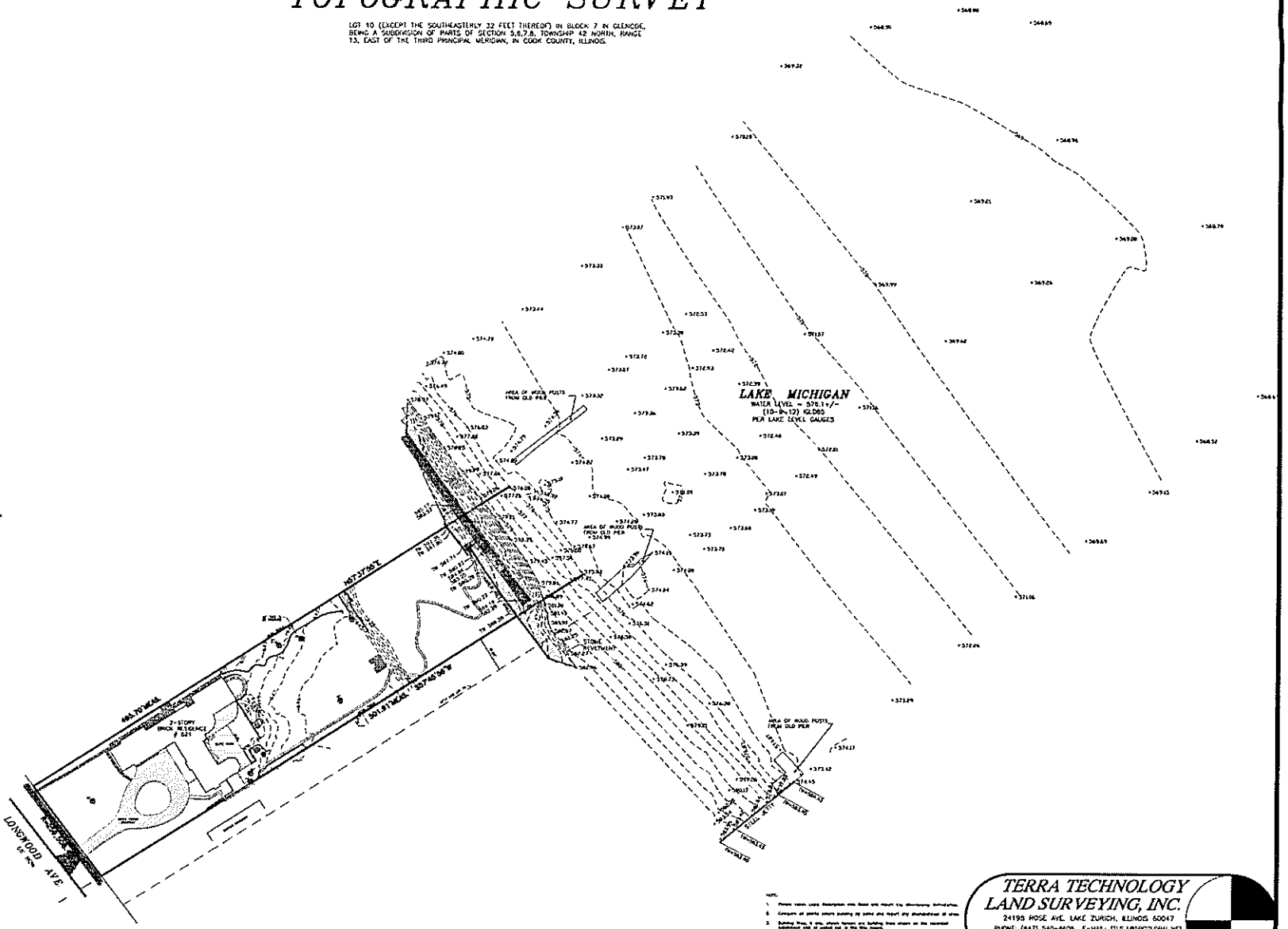
515 and 521 Longwood Ave
Glencoe, IL 60022

G L E N C O E


L A K E  M I C H I G A N

# TOPOGRAPHIC SURVEY

LOT 10 (EXCEPT THE SOUTHEASTERLY 22 FEET THEREOF) IN BLOCK 7 IN GLENCOE, BEING A SUBDIVISION OF PARTS OF SECTION 5,6,7,8, TOWNSHIP 42 NORTH, RANGE 13, EAST OF THE THIRD PRINCIPAL MERIDIAN, IN COOK COUNTY, ILLINOIS.




SCALE: 1" = 40'

GRAPHIC SCALE

( IN FEET )
1 inch = 40 ft

STATE OF ILLINOIS
COUNTY OF LAKE ss.

I, Kevin Z. Neumann an Illinois Professional Land Surveyor, do hereby certify that I have surveyed the property described above and that the plat shown hereon is a correct representation of said survey.

DATED THIS 10th DAY OF OCTOBER, A.D. 2012

BY: _____

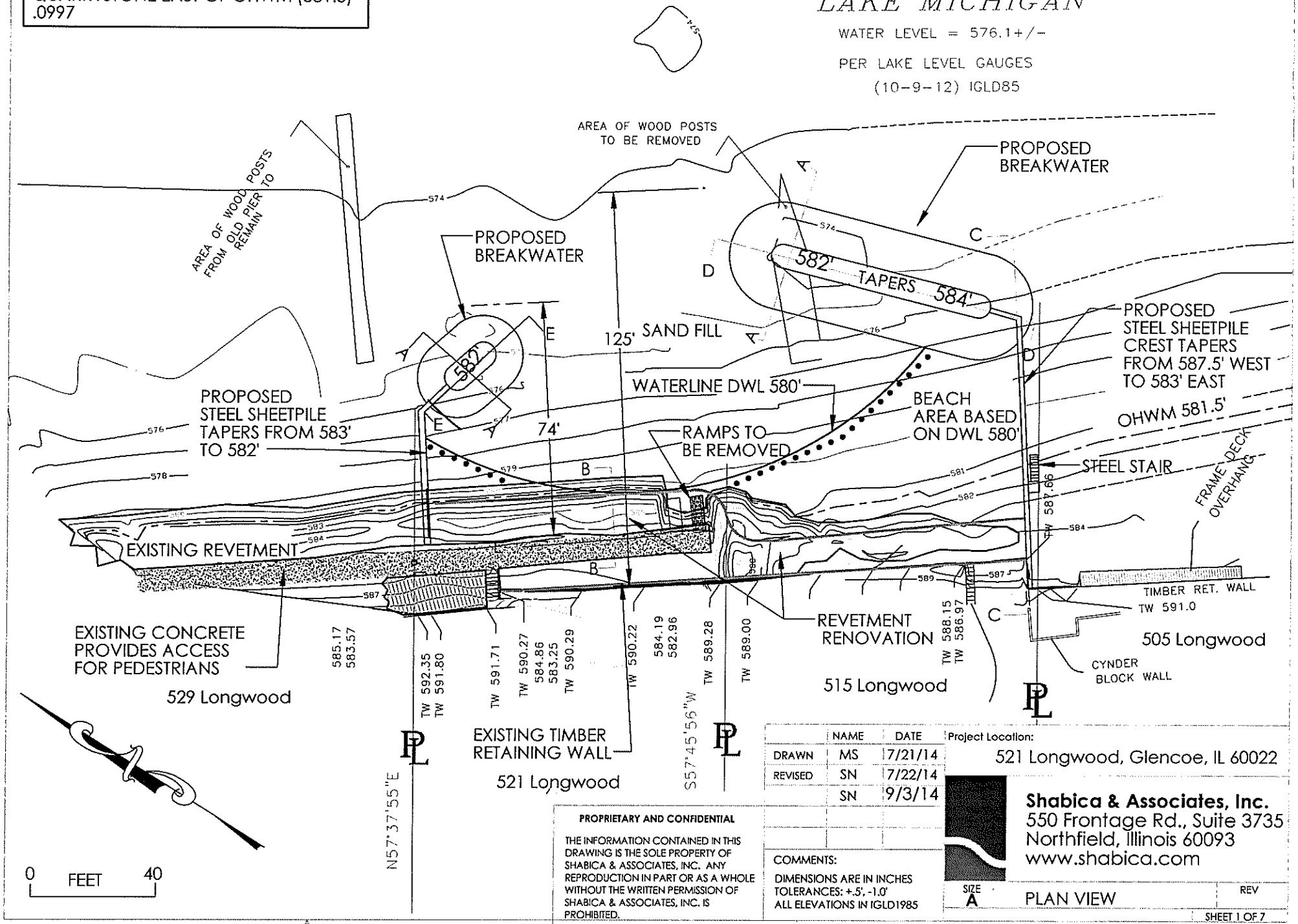
Illinois Professional Land Surveyor No. 3210
License Renewal Date : 11/30/2013
DESIGN FIRM NO. 184-004538 RENEWAL DATE 4/30/2013

NOTE:
1. Please check Legal Description with Deed and report any discrepancy immediately.
2. Compare all points before building by same and report any discrepancies at once.
3. Building lines, if any, shown hereon are building lines shown on the recorded subdivision plat or supplied by the title report.
4. Consult local authorities for building lines established by local ordinances.
5. This professional service conforms to the current Illinois Minimum standards for a boundary survey.


TERRA TECHNOLOGY LAND SURVEYING, INC.
24195 ROSE AVE. LAKE ZURICH, ILLINOIS 60047
PHONE: (847) 540-8408 E-MAIL: TTLS.1@SBCGLOBAL.NET


JOB NO. : 12-0001 SURVEY DATE : 10/09/2012
DWG FILE : DATA/12/0060/SITE-TOPO-10-9-12.DWG

SURFACE AREA OF WETLANDS FILLED BY QUARRYSTONE EAST OF OHWM (581.5)= .0997




| | NAME | DATE |
|---|---|---|
| DRAWN | MS | 7/21/14 |
| REVISED | SN | 7/22/14 |
| | SN | 9/3/14 |

Project Location:
521 Longwood, Glencoe, IL 60022



COMMENTS:
DIMENSIONS ARE IN INCHES
TOLERANCES: +.5', -1.0'
ALL ELEVATIONS IN IGLD1985

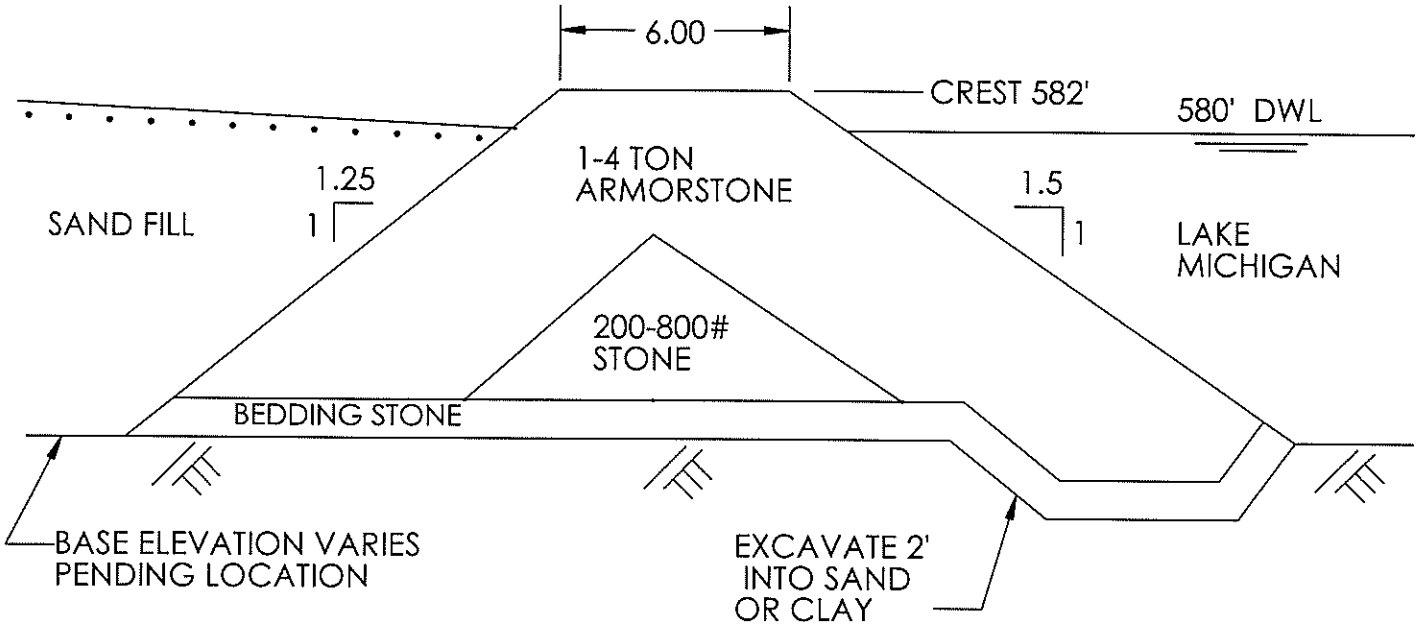

**Shabica & Associates, Inc.**
550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
www.shabica.com


SIZE A | PLAN VIEW | REV

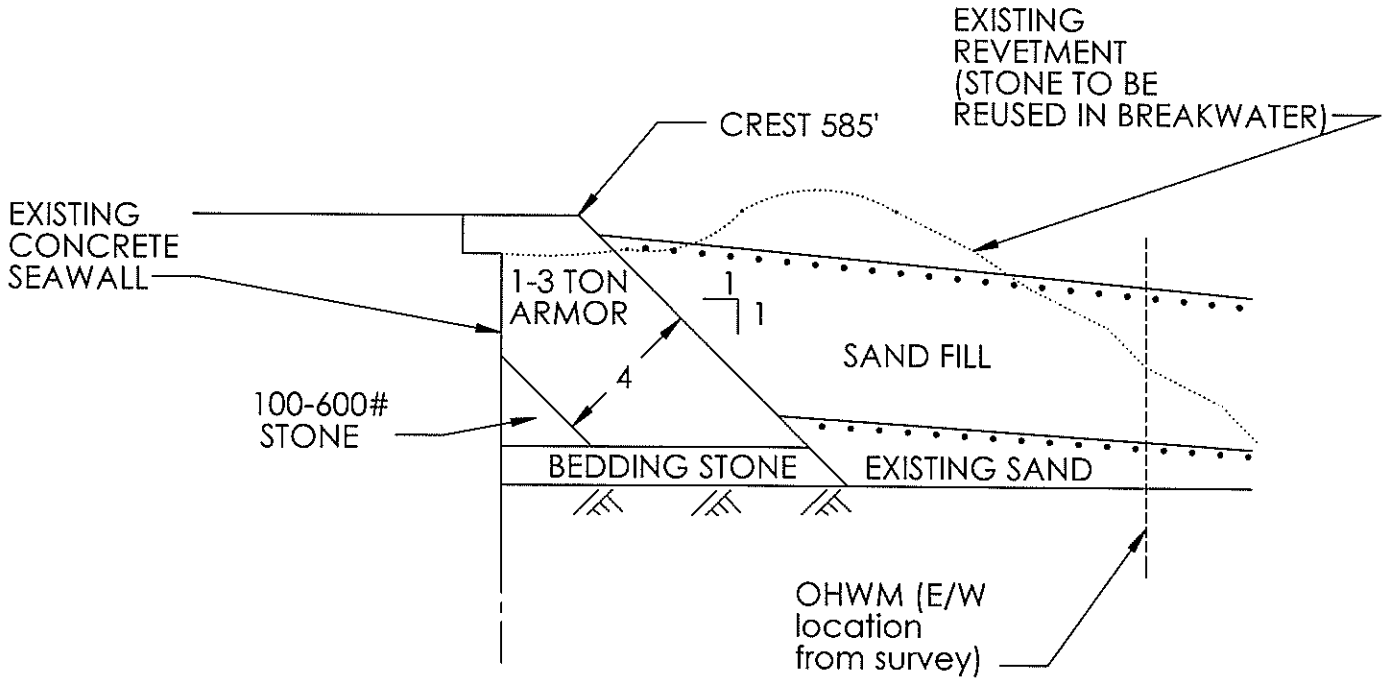
SHEET 1 OF 7

5 4 3 2 1

## BREAKWATER CROSS SECTION A-A




## REVETMENT CROSS SECTION B-B




0 FEET 5

SCALE

| | NAME | DATE |
|---|---|---|
| DRAWN | MS | 7/17/14 |
| CHECKED | SN | 7/18/14 |
| REVISED | SN | 9/3/2014 |
| | | |
| | | |



COMMENTS:

DIMENSIONS ARE IN FEET
TOLERANCES: +.5', -1'
ALL ELEVATIONS IN
IGLD 1985

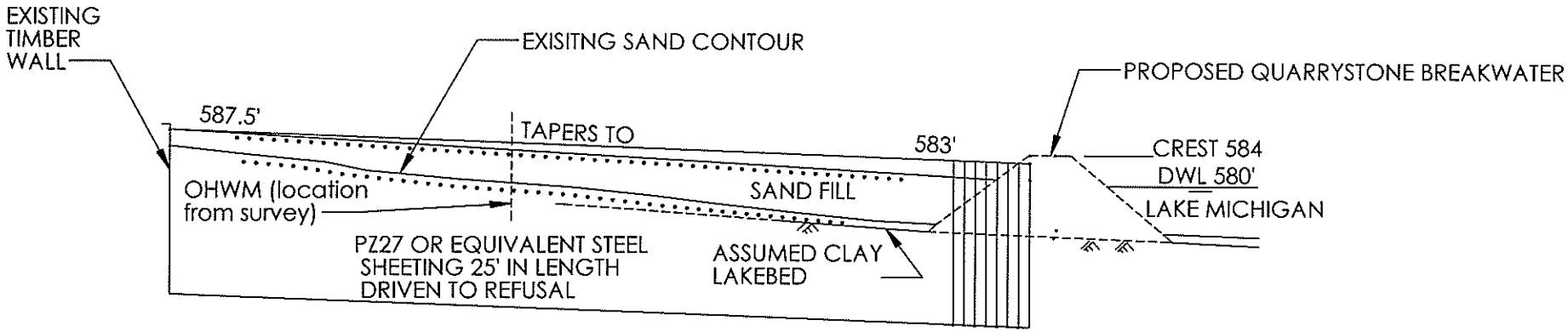
Project Location:
521 Longwood Glencoe, IL


**Shabica & Associates, Inc.**
550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
847-446-1436
www.shabica.com


SIZE A | CROSS SECTION | REV.

SCALE 1"=5' | SHEET 2 OF 7

STEEL CROSS SECTION C-C




0 FEET 20

ALL ELEVATIONS 1985 IGLD

| | NAME | DATE |
|---|---|---|
| DRAWN | MS | 7/9/2014 |
| REVISED | SN | 9/3/2014 |

Project Location: 521 Longwood, Glencoe IL, 60022



COMMENTS:

DIMENSIONS ARE IN INCHES
TOLERANCES: +.5', -1.0'
ALL ELEVATIONS IN IGLD1985

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Northfield, Illinois 60093
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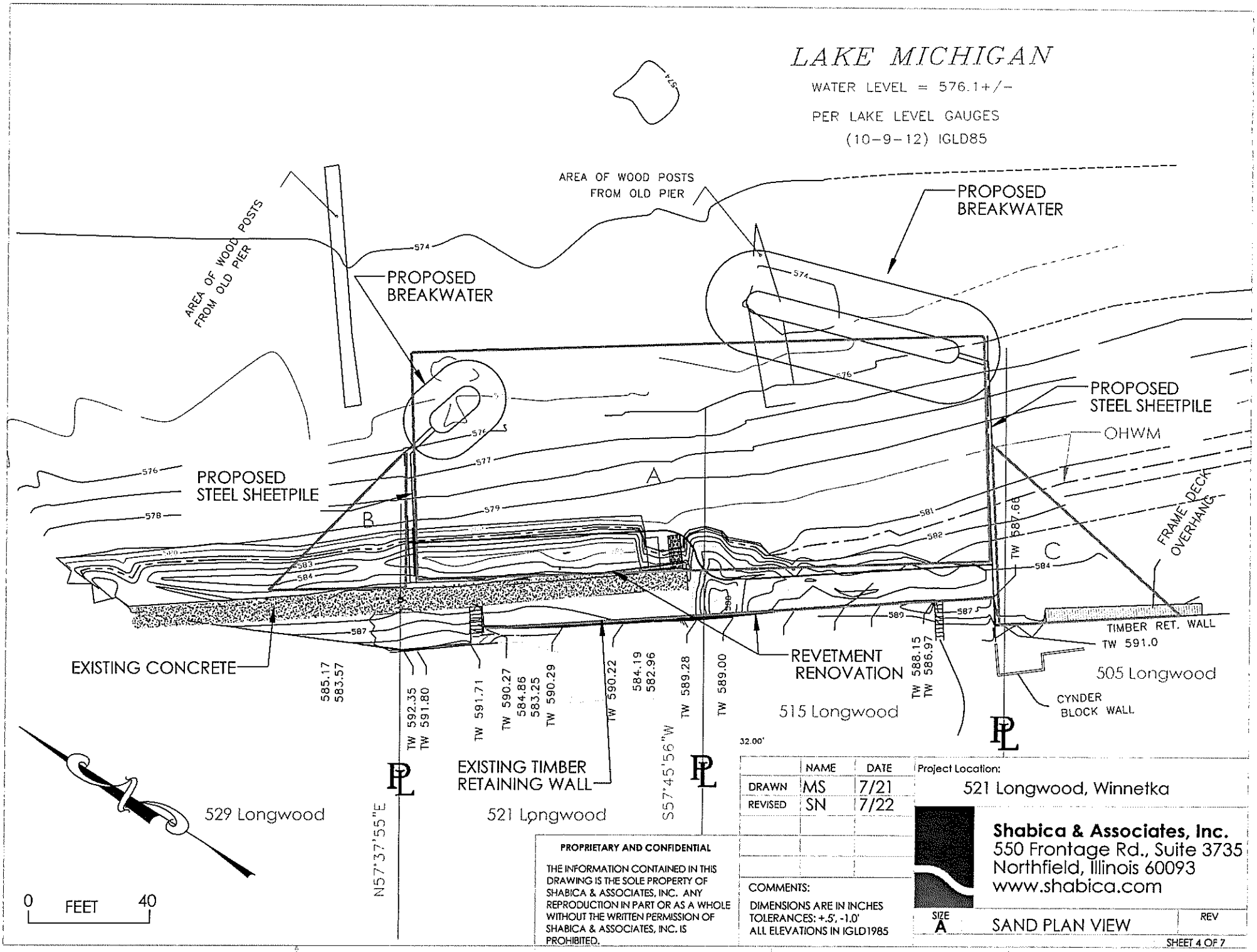
SIZE A

CROSS SECTION

REV

SHEET 3 OF 7

5 4 3 2 1




| | NAME | DATE |
|---|---|---|
| DRAWN | MS | 7/21 |
| REVISED | SN | 7/22 |

Project Location:
521 Longwood, Winnetka



COMMENTS:
DIMENSIONS ARE IN INCHES
TOLERANCES: +.5', -1.0'
ALL ELEVATIONS IN IGLD1985

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Northfield, Illinois 60093
www.shabica.com

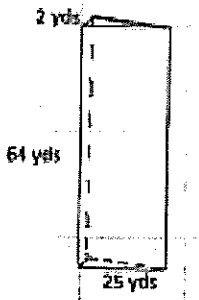
SIZE A

SAND PLAN VIEW

REV

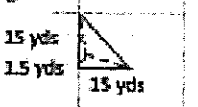
SHEET 4 OF 7

A



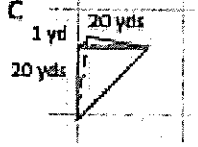

VOL A: $\frac{64 \text{ yds} \times 25 \text{ yds} \times 2 \text{ yd}}{2} = 1{,}600 \text{ yds}^3$

B




VOL B: $\frac{15 \text{ yds} \times 15 \text{ yds} \times 1.5 \text{ yds}}{6} = 56 \text{ yds}^3$

C




VOL C: $\frac{20 \text{ yds} \times 20 \text{ yds} \times 1 \text{ yds}}{6} = 67 \text{ yds}^3$

**TOTAL:**

**1,723 yds³ x 1.25 yds/ton = 2,154 tons**

**2,154 tons x 20% overfill = 431 tons**

**TOTAL:**

**2,154 tons + 431 tons = 2,585 tons**

## 2,600 Tons Clean Sand

## To Be Placed



| | NAME | DATE |
|---|---|---|
| DRAWN | SN | 7/22/14 |
| CHECKED | MS | 7/22/14 |

COMMENTS:

DIMENSIONS ARE IN FEET
TOLERANCES: +.5', -1'
ALL ELEVATIONS IN IGLD 1985

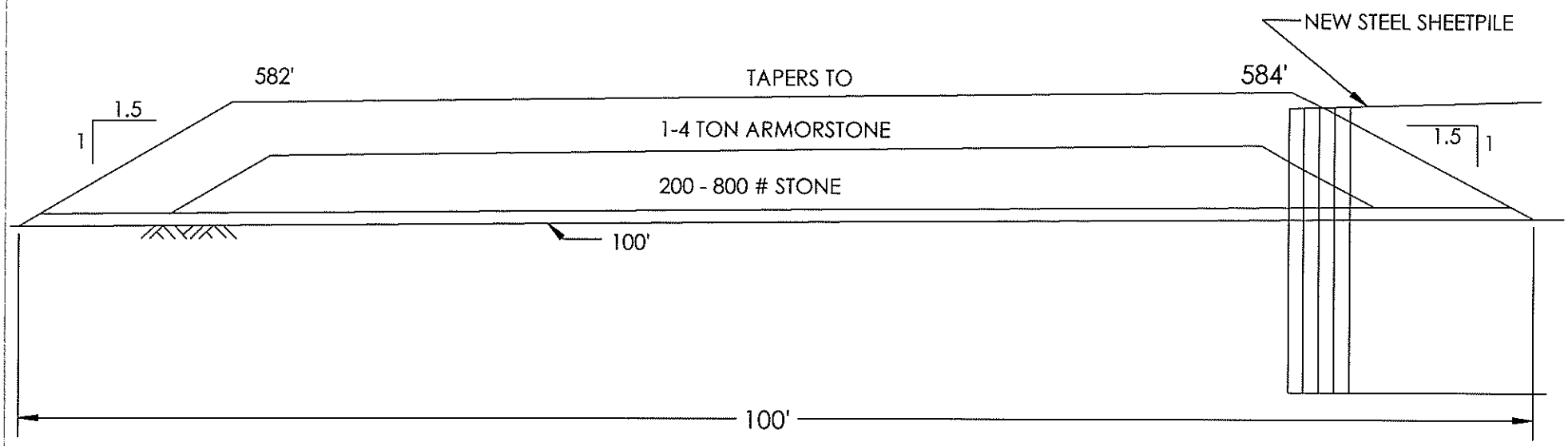
Project Location:
521 Longwood, Glencoe

**Shabica & Associates, Inc.**
550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
847-446-1436
www.shabica.com

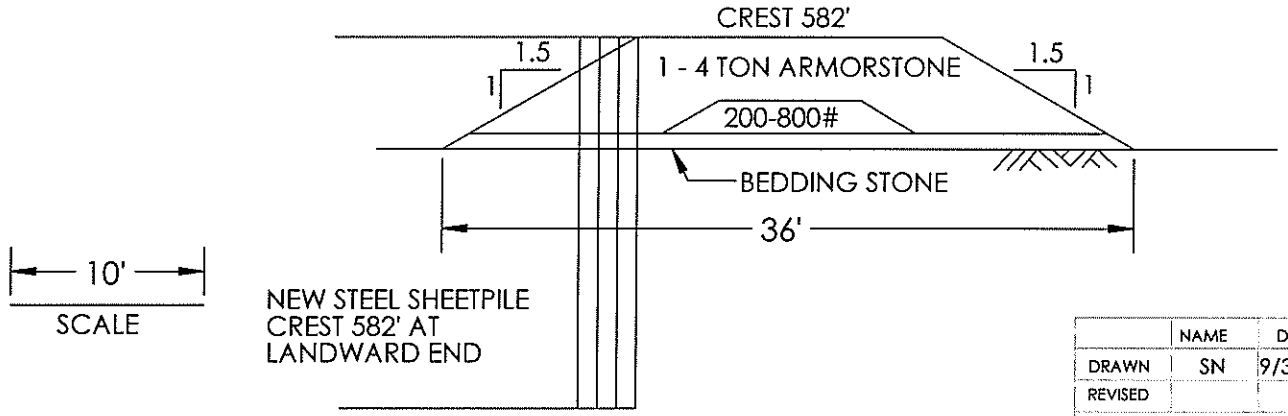
SIZE A | Sand Calculations | REV.

SCALE 1"=5' | SHEET 5 OF 7

## BREAKWATER CROSS SECTION D-D




## BREAKWATER CROSS SECTION E-E




| | NAME | DATE |
|---|---|---|
| DRAWN | SN | 9/3/2014 |
| REVISED | | |

Project Location:
521 Longwood, Glencoe, IL 60022



COMMENTS:
DIMENSIONS ARE IN INCHES
TOLERANCES: +.5', -1.0'
ALL ELEVATIONS IN IGLD1985

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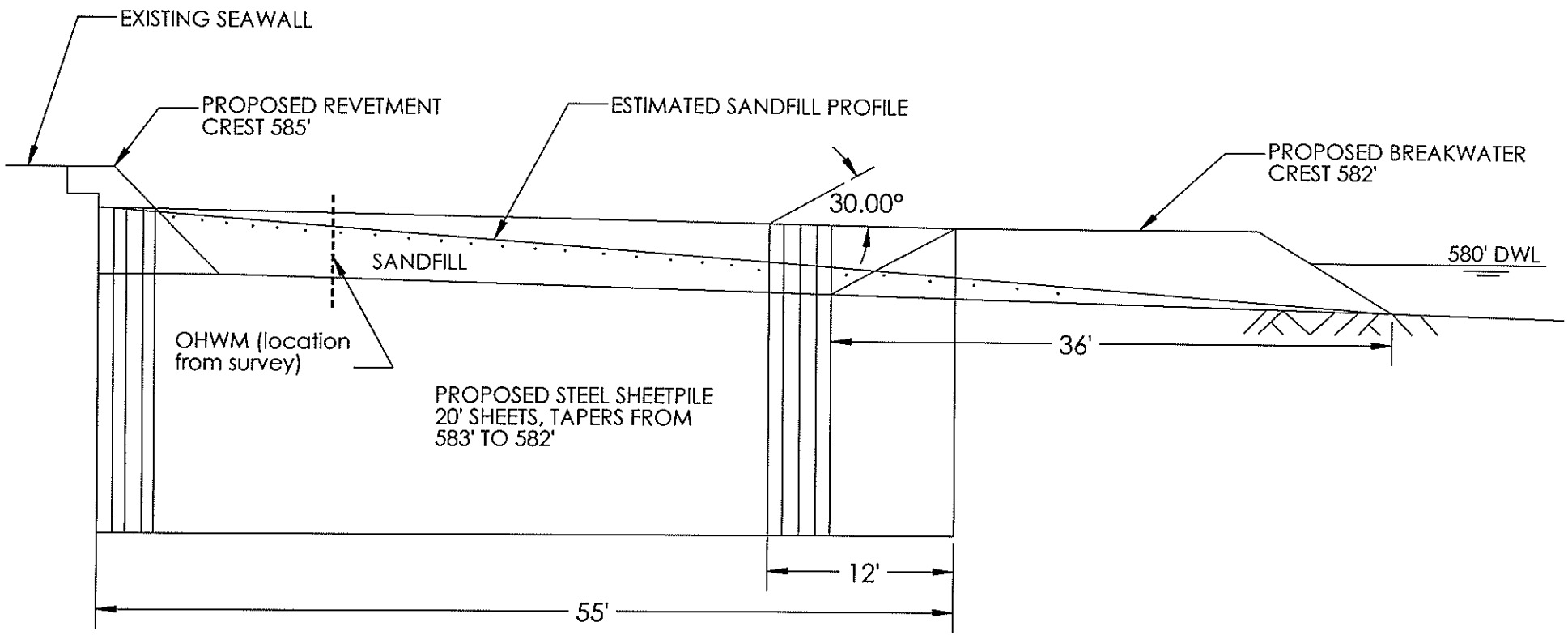
Northfield, Illinois 60093
www.shabica.com

SIZE A | Sections D-D & E-E | REV

SCALE: 1"=10' | SHEET 6 OF 7

5 4 3 2 1

# PROFILE THROUGH NORTH STEEL AND BREAKWATER




10'
SCALE

| | NAME | DATE |
|---|---|---|
| DRAWN | SN | 9/3/2014 |
| REVISED | | |

Project Location:
521 Longwood, Glencoe IL 60022



COMMENTS:

DIMENSIONS ARE IN INCHES
TOLERANCES: +.5', -1.0'
ALL ELEVATIONS IN IGLD1985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550 Frontage Rd., Suite 3735
Northfield, Illinois 60093
www.shabica.com


SIZE A | Profile North Breakwater | REV

1"=10'

SHEET 7 OF 7

5 4 3 2 1